

**FIVE YEAR REPORT ON THE
MEDICAL FOLLOW UP OF
MARSHALLESE RECEIVING SPECIAL
MEDICAL CARE RELATED TO
1954 BRAVO FALLOUT RADIATION
(JANUARY 1992 - 1996)**



June 1999

U.S. Department of Energy
Office of Environment, Safety and Health
Office of International Health Studies

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By

Ashok N. Vaswani, M.D.

And

Jean E. Howard, M.D.

**Brookhaven National Laboratory
Medical Department
Upton, New York 11973**

June 1999

**Prepared for
U.S. Department of Energy
Assistant Secretary for Environment, Safety and Health
Office of Health**

FOREWORD

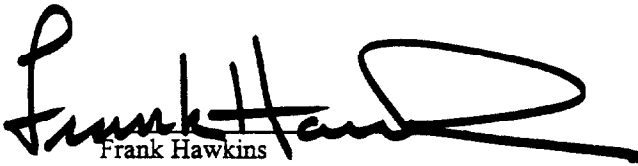
As part of the United States atmospheric nuclear weapons testing program between 1946 and 1958, 23 nuclear devices were detonated at the Bikini Atoll and 43 nuclear devices were detonated at the Enewetak Atoll. A 1954 United States thermonuclear weapons test, code named "Bravo" was conducted at the Bikini Atoll and produced a nuclear yield much higher than expected. As a result, the levels and dispersion of the radioactive fallout from Bravo were significantly greater than originally expected, resulting in radioactive fallout on the inhabited atolls of Rongelap and Utrik. The Rongelap and Utrik inhabitants were evacuated from their contaminated atolls, within 48 and 72 hours, respectively, after the Bravo test. The original population directly exposed to the fallout from Bravo consisted of 241 individuals and 12 fetuses. Adsorbed dose estimates for the exposed population were on the order of 0.11 to 1.9 Gray (11 to 190 Rad) to the whole body and from 1.9 to 200 Gray (190 to 20,000 Rad) to the thyroid.

Public Law 99-239 mandated that the United States would "...continue to provide special medical care and logistical support thereto for the remaining 174 members of the population of Rongelap and Utrik who were exposed to radiation resulting from the 1954 United States thermonuclear Bravo test...". The Department of Energy (DOE) implemented this Congressional mandate, for the period of this report, through a contract with the Brookhaven National Laboratory.

The purpose of the Marshall Islands Medical Program is to provide medical care and treatment to the Congressionally-mandated groups of Rongelap and Utrik who were exposed to fallout from the 1954 Bravo test. As of December 1998, the original Congressionally-mandated population consisted of 130 individuals.

The program offers, on a voluntary basis, an annual physical examination to these individuals, as well as annual physical examinations to volunteer comparison individuals. Medical surveillance includes a complete annual physical examination (based on American Cancer Society criteria) by a variety of specialists including gastroenterologists, hematologists, obstetricians/gynecologists, endocrinologists, oncologists, radiologists, cardiologists, nephrologists, pulmonologists, and rheumatologists.

This, the 17th report of the Marshall Islands Program, provides information concerning the medical status of the 253 Marshallese exposed to the fallout from the 1954 Bravo test.

A large, stylized handwritten signature in black ink, appearing to read "Frank Hawkins".

Frank Hawkins
Director
Office of International
Health Programs

DEDICATION AND APPRECIATION

This report is dedicated to all of the patients who have participated for the past 44 years in the medical program. We wish to thank them for their voluntary participation in one of the longest running patient care programs in the history of medical practice, and sincerely appreciate their commitment. We wish them continued success in reaching their future health objectives.

The Marshall Islands Medical Program is deeply indebted to the many outstanding physicians who, despite the inevitable personal inconvenience, participated in the medical team visits of 1992-1996. It is fair to say that they were the heart of the program.

CONTENTS

| | Page |
|--|------|
| Introduction | 1 |
| Patient Groups | 1 |
| The Marshall Islands Medical Program | 1 |
| Program Mandate | 1 |
| Program Administration and Physician Volunteers | 1 |
| Program Policies | 2 |
| Interim Care | 2 |
| Consultations and Educational Activities | 3 |
| Program Oversight | 3 |
| Program Operations and Procedures | 3 |
| Staff | 4 |
| Clinical Follow Up for the 5 Year Period | 5 |
| Patient Participation | 5 |
| Examinations and Laboratory Testing | 5 |
| Specific Medical Conditions - Thyroid Nodules | 6 |
| Histologic Definitions | 8 |
| Sigmoidoscopies and GI Workup | 11 |
| Referrals to the Tertiary Medical Care Center and to the RMI Government | 11 |
| Patient Deaths During 1992-1996 | 11 |
| Bibliography | 17 |
| Epilogue | 18 |
| Appendix A - List of Participating Physicians and Technical Staff | A-1 |
| Appendix B - Results of CBCs and Laboratory Chemistries Using Patient ID Numbers | B-1 |

5-Year Report

INTRODUCTION

This is the 17th and final report of the Marshall Islands Medical Program as carried out by the Brookhaven National Laboratory (BNL). The purpose of these publications has been to provide information on the medical status of 253 Marshallese exposed to radiation fallout in 1954. The medical program fulfills a commitment to disclose unique medical information relevant to public health. Details of the Bravo thermonuclear accident that caused the exposure have been published. A 1955 article in the Journal of the American Medical Association, which described the acute medical effects on the population that required special medical care, remains a definitive and relevant description of events (Cronkite et al., 1955).

Marshallese participation in this Congressionally mandated program is voluntary. Throughout the 44 years of the program, each participating individual's relevant medical findings, laboratory data, disease morbidity, and mortality have been published in the BNL reports in a manner preserving patient confidentiality. In each report, there has been an attempt to interpret these findings and to infer the role of radiation exposure in their development. An equally important aspect of the reports has been the presentation of data that allows for analyses of the medical consequences of the Marshallese exposure.

PATIENT GROUPS

The Marshallese population mandated (the mandated group) under the Compact of Free Association Act (P.L. 99-239), originally comprised 64 persons on Rongelap Atoll who had received an estimated 190 rad (190 cGy) of whole-body external gamma radiation, 18 on Ailinginae Atoll (Sifo Island) who received 110 rad (110 cGy), and 159 on Utrik Atoll who received 11 rad (11 cGy). For the purpose of this report, the Rongelap and Ailinginae patients are treated as one and referred to as the Rongelap group because the persons on Ailinginae were Rongelap inhabitants temporarily residing on this nearby atoll. The differences in the dose due to exposure to radioiodines were dependent on the relative distance of the atolls and islands from the Bravo test site. At the time of the accident, there were 12 pregnant women (3 on Rongelap, 1 on Ailinginae, and 8 on Utrik), each of whom received whole-body doses equivalent to doses received by the other inhabitants of their respective atolls. The twelve individuals who were exposed in utero were also considered part of the mandated group after

birth. Due to the presence of radioiodines in the fallout, the thyroid gland received an exposure that was much greater than the whole-body dose; the dose due to radioiodine exposure was a function of the individual's age at the time of exposure (Lessard et al., 1985).

In 1957, a group of 86 volunteer comparison individuals from Rongelap were selected to match the mandated group by gender and age (Conard et al., 1958). A second volunteer comparison group was subsequently initiated and matched by age and gender to the mandated group. The second comparison group was statistically similar to the Rongelap and Utrik groups. Both these groups are listed in this report as the comparison group. As in previous reports, it is the expanded volunteer non-mandated group which is used for comparisons of year-to-year medical events and causes of death. The survival rates of the mandated and volunteer unmandated groups are also compared.

THE MARSHALL ISLANDS MEDICAL PROGRAM

Program mandate:

The mandate of the program, as required by the U.S. Congress in 1980 (PL 96-205, Sec. 106 (a)), specified "...a program of medical care and treatment....for any injury, illness, or condition which may be the result directly or indirectly of such nuclear weapons testing program." Subsequently, in 1985, the Compact of Free Association between the U.S. and the Republic of the Marshall Islands (RMI) allowed the Marshallese to manage their own radiation injury compensation. However, in response to a request from the RMI, a subsidiary agreement permitted the BNL medical program to continue supplemental local health care for the mandated persons. Specifically, P.L. 99-239 states: "...the President....shall continue to provide special medical care and logistical support thereto for the remaining 174 members of the population of Rongelap and Utrik who were exposed to radiation resulting from the 1954 United States thermonuclear Bravo test, pursuant to Public Laws 95-134 and 96-205."

Program administration and physician volunteers:

The Marshall Islands Medical Program and its medical missions to the Marshall Islands were based at BNL since the inception of the program. The program's staff included a physician-director, an administrator, a BNL medical associate, and a Marshallese laboratory technician on Ebeye. The